

THURSDAY, AUGUST 21, 1879

WEATHER CHARTS FOR THE NORTHERN HEMISPHERE

WE present to our readers with this number a copy of the latest work of the United States Signal Office—the Monthly International Weather Chart of the Northern Hemisphere based on simultaneous observations. The copies are the first published for distribution in Europe, and are at our request furnished from Washington. The work marks an important step in meteorological progress. The origin and purposes of the chart and its connection with others are sufficiently set forth in the following extracts from the Annual Report of the Chief Signal Officer to the Hon. Secretary of War of the United States:—

"The proposition adopted at the congress of persons charged with meteorological duties, assembled at Vienna in 1873, and to the effect that it is desirable, with a view to their exchange, that at least one uniform observation, of such character as to be suited for the preparation of synoptic charts, be taken and recorded daily and simultaneously at as many stations as practicable throughout the world, has continued to have practical effect.

"By authority of the War Department, and with the courteous co-operation of scientific men and chiefs of meteorological services representing the different countries, a record of observations taken daily, simultaneously with the observations taken throughout the United States and the adjacent islands, is exchanged semi-monthly. These reports are to cover the territorial extent of Algiers, Austria, Australasia, Belgium, Great Britain, China, Central America, Denmark, France, Germany, Greece, Greenland, India, Italy, Iceland, Japan, Mexico, Morocco, the Netherlands, Norway, Portugal, Russia, Spain, Sweden, Switzerland, Turkey, Tunis, British North America, the United States, the Azores, Sandwich Islands, Malta, Mauritius, West Indies, South Africa, and South America.

"On July 1, 1875, the daily issue of a printed bulletin, exhibiting these international simultaneous reports, was commenced at this office, and has been since maintained. A copy of this bulletin is furnished each co-operating observer. The results to be had from the reports thus collated are considered as to be of especial importance. The bulletin combines, for the first time of which there is record, the labours of the nations in a work of this kind for their mutual benefit. There is needed only the assistance to be had from the naval forces of the different powers (that of the navies of the United States and of Portugal being as heretofore related already given to extend the plan of report upon the seas) to bring more fully within the scope of study observations practically extending around the northern hemisphere. This end is to a great extent already attained.

"In this connection the office has to acknowledge the cordial and valuable co-operation of the meteorological services of the different countries, represented as follows:—

"Algiers, by General Teissier, Commandant Supérieur du Génie; Austria, by Prof. Dr. Julius Hann, Director of the Imperial and Royal Central Meteorological Institute at Vienna; Belgium, by J. C. Houzeau, Director of the Royal Observatory at Brussels; Great Britain, by Robert H. Scott, F.R.S., Secretary of the Meteorological Council, London; Alexander Buchan, M.A., F.R.S.E., Secretary of the Scottish Meteorological Society, Edinburgh, and the respective observers; Costa Rica, by

Señor Federico Maisón, Director of the Central Office of Statistics and Meteorology; Denmark, by Capt. N. Hoffmeyer, Director of the Royal Danish Meteorological Institute at Copenhagen; France, by U. J. Le Verrier, Director of the Paris Observatory, Prof. E. Mascart, Director of the Central Meteorological Bureau of France, and the respective observers; Germany, by Prof. Dr. Geo. Neumayer, Director of the German Naval Observatory, Hamburg; Greece, by Prof. Dr. J. F. Julius Schmidt, Director of the Royal Observatory at Athens; India, by H. F. Blanford, Meteorological Reporter to the Government of India; Italy, by the Minister of Agriculture, Industry, and Commerce, and the respective observers; Japan, by the Imperial Meteorological Observatory, and the Imperial University of Tokei, Japan; Mexico, by Señor Mariano Barcena, Director of the Central Meteorological Observatory in the City of Mexico, and the respective observers; Netherlands, by Prof. Buys Ballot, Director of the Royal Meteorological Institute of the Netherlands at Utrecht; Norway, by Prof. H. Mohn, Director of the Royal Norwegian Meteorological Institute at Christiania; Portugal, by J. C. de Brito Capello, Director of the Meteorological Observatory of the Infante Don Luiz, at Lisbon; Russia, by Prof. H. Wild, Director of the Imperial Central Physical Observatory of Russia, at St. Petersburg; Spain, by Antonio Aguilar, Director of the Royal Observatory at Madrid, and the respective observers; Sweden, by Prof. R. Rubenson, Director of the Royal Swedish Meteorological Institute at Stockholm, and of Dr. H. H. Hildebrandsson, Chief of the Meteorological Division of the Upsala Observatory; Switzerland, by Prof. R. Wolf, Director of the Observatory at Zurich, and of Prof. E. Plantamour, Director of the Observatory at Geneva; Turkey, by A. Coumbaray, Effendi, Director of the Central Observatory at Constantinople, and of Prof. C. V. A. van Dyck, Superintendent of the Lee Observatory at Beirut; Canada, by Prof. G. T. Kingston, Director of the Magnetic Observatory at Toronto, and Superintendent of the Meteorological Office of the Dominion of Canada, and the respective observers; United States Navy, by Navy Department, through Rear-Admiral Daniel Ammen, and Commodore W. D. Whiting, U.S.N., Chiefs of the Bureau of Navigation; and by individual observers at other points.

"The Office has to regret the death since the date of the last annual report of the following distinguished co-labourers in the work:—Urbain Jean Joseph Le Verrier, Director of the Paris Observatory, Prof. Ernst Quetelet, Director of the Royal Observatory at Brussels, Prof. Edward Heis, of Münster, and Prof. Pietro Angelo Secchi, of Rome.

"A number of observations taken on vessels at sea to complement the synchronous reports of the service, and at the request of the department, have been received on the form provided for the purpose, paper 49. Their utility is evident in the study of storms approaching our coasts or which endanger vessels sailing from our ports.

"The co-operation of the navy of the United States in the taking of observations simultaneously with the system adopted at this office, wherever naval vessels of the United States may be, as assured by the general order of the Secretary of the Navy, dated December 25, 1876, has largely increased the data of this class. This co-operation has been skilfully rendered by the Navy Department and the United States Navy, through the Chief of the Bureau of Navigation.

"The people of the United States are thus the first nation whose army and navy co-operate, as all armies and navies should, under official orders, in the taking of simultaneous observations wherever the forces may be.

"In view of the existence of the system of simultaneous reports to be made at sea by the vessels of the naval and commercial marines of the United States and other nations, and to provide for its extension, carefully tested

barometers of the best make have, since the date of the last annual report, been prepared and located, as standards, at the ports of New York and San Francisco.

"These barometers have been publicly located to afford means for comparison of the ships' barometers of the shipping of all nations. The instruments, while carefully guarded, are easily accessible. Public notice is given of the location, and a sergeant of the Signal Corps attends daily to give information and to take charge of any ship's barometer which may be brought for comparison (Paper 48).

"The standard barometer for the use of shipping in the Atlantic Ocean is located at the Maritime Exchange, in New York City; the standard barometer for the use of shipping in the Pacific Ocean is located at the Merchants' Exchange, in the city of San Francisco.

"The officers of the Signal Service at the different cities and ports of the United States and upon the sea-coast offer every facility and aid in their power to the vessels of any nation.

"With the plans for charting now adopted at this office, and with the reports now received here, it appears that the meteoric changes occurring over a great portion of the continents north of the equator can be charted with an accuracy sufficient to permit careful and valuable study. This charting to be of the best attainable value, must be supplemented from the records of observations had on the seas. A ship at sea becomes one of the best of stations for a simultaneous system. The value of the record is enhanced by the change of the ship's location occurring within each period of twenty-four hours. There is no sea-going vessel but which carries human life, and each ought to carry by compulsion, if need be, meteorological instruments. The smallest craft, in caring for its own safety, may use them enough to add to the value of the most extensive record. There is no nation without interest in the work proposed to be based upon exchanged simultaneous reports, and none has hitherto hesitated, when the subject has been properly presented, to aid in a duty which, so easily done as to require very little effort on the part of any one person, has for its object a good to mankind. The work cannot, from its nature, be for the selfish good of any section.

"A number of the great steamship companies, foreign and domestic, operating the principal commercial sea-routes, have promised and will give their powerful influence and aid.

"The office has the co-operation of the Pacific Mail Steamship Company, through its agents, Williams, Blanchard and Co.; the White Star Line, through its agents, Ismay, Imrie and Co., Liverpool, and R. J. Curtis, New York; the Occidental and Oriental Steamship Company, through its president, George H. Bradbury; the North German Lloyd, through its agents, A. Schumacher and Co.; the American Steamship Company, through its president, H. D. Welsh; the Red Star Line, through its president, James A. Wright, and the Allan Line, through its agents, A. Schumacher and Co.

"The United States bear, in the cases of all maritime observers co-operating in this system, all expenses for forms, postages, &c., when so desired, and not infrequently, and, when necessary, loan the required instruments.

"The number of observations made daily on separate vessels at sea is 100 (Paper 13).

"Research has already gone far enough to indicate the paths by which, if it cannot be directly predicted, it can at least be studied, to learn what sequences to follow conditions reported on or near the eastern coast of Asia, or on the Pacific, will be found on our own western coasts.

"Similar studies will have reference to our own southern and eastern coasts, and to the western coasts of the European continent. The time cannot be far distant when vessels leaving any Atlantic port may be informed

whether any notable disturbance exists at sea and where it is likely to threaten the voyage.

"The establishment of permanent ocean stations in lines traversing the oceans over or near the telegraphic cables, and in telegraphic communication with either continent, is not considered impracticable, and has been referred to in a preceding report.

"There is reason to hope that a progress has been made which will eliminate from the study of practical international meteorology some of the difficulties hitherto encountered.

"There are grounds to hope also that the atmospheric conditions and changes of condition can be charted with sufficient accuracy over any extent of the earth's surface.

"If the hope has fruition, meteorological barriers will, as against study, practically cease to exist.

"A copy of the International Bulletin herewith (Paper 27) exhibits the character of the international reports, and that of the information had from each station. The chart accompanying this bulletin shows as nearly as practicable the location of the stations, and foreshadows the duties and reports had from them will make practicable. The number of stations reporting increases.

"While the stations are crowded in some localities, each is useful—each serving to check the work of the other, and each aiding to close the gaps the failure of other stations might sometimes cause. The work is not likely to be abandoned by those in the different countries who have taken part in establishing it, and who share its benefits. If it serve no other purpose than to maintain, as it does, the pleasant co-operation of those charged with the meteorological duties of the different countries, it would be of value. It is hoped that by systems of observations thus extensive, generalisations may be had to permit the announcement of meteoric changes for periods longer in advance than have hitherto practicable.

"The average number of daily simultaneous observations now made in foreign countries is 293. The total number of stations on land and *on vessels at sea from which reports are entered in the bulletin regularly* is 557. The co-operation of the different nations secured by this plan of exchange, as above described, renders the additional cost to the United States of the grand system of reports it makes possible but little more than that of the cost of the preparation, paper, and binding of the International Bulletin and the accompanying charts, a cost which would have to be met in great part for the proper preservation of the records themselves even if the bulletins were not distributed.

"The Chief Signal Officer is gratified to announce in this report that the work of the collection of the reports of international simultaneous observations, carried on in foreign countries in co-operation with the United States, as well as within the territories of the United States and upon the seas thus above referred to, has in the year just passed so far progressed as to have attained one principal result for which it was set on foot. On July 1, 1878, it became possible for the first time in the history of this office to commence the issue, on that date, of a daily international weather map, charted daily and issued daily, each chart based upon the data appearing upon the International Bulletin of simultaneous reports of similar date. The charting extends around the world, and embraces for its area the whole northern hemisphere.

"The daily issue of a chart of this kind, thus daily issued for the first time by the United States, is without a precedent in history. It exhibits the co-operation, for a single purpose, of the civilised powers of the world north of the equator.

"The studies such charts make possible, the improvement which will come as the work progresses and the area of the chart is better filled with reports of observations carefully elaborated, are fully appreciated by scientific men. The questions as to the translations of storms

from continent to continent, and of the times and directions they may take in such movements; the movement of areas of high and of low barometer; the conditions of temperature, pressure, and wind-direction existing around the earth at a fixed instant of time, permitting thus the effects of day and night to be contrasted; the distribution and amount of rainfall, and other studies, many and valuable, only suggested by this enumeration, may be by such studies settled. It seems not impossible that in the future questions of climatology, and perhaps others bearing upon the prediction of weather changes far in advance of the time at which these changes may happen, or questions of the character of coming seasons even, may be answered by the researches these charts will make practicable.

"The very great aid and material furnished in this elaborated form gives to the search for generalisation, or for data in the support of theories, was referred to in the last annual report. In frequent cases little more than collation is necessary.

"As a means of better combining the work and the interests of the several nations; of certainly securing that co-operation at sea which will enable the lines of the charting to be drawn as fully and as well over oceans as over continents; and which will give the world ultimately a knowledge as practical of the movement of areas of disturbance in the midst of the seas as is now had of such movements on some continents, the undertaking is of much importance.

"It is an advantage of the charting draughted from simultaneous reports that studies by normals, not possible in any other way, can be made. The normal pressure, temperature, &c., arrived at from observations taken at any one place, at the same and a fixed instant of time every day, become established as to that place and time with accuracy. Many causes of error are eliminated.

"The intercomparison of these normals with the normals taken at other places simultaneously with the first and under the similar condition that the normals to be found for those places are to be from observations taken at those places at a fixed time and on every day, gives results reliable and different from those to be had by the use of normal readings arrived at in any other manner. Normals for the year, for the season, and for the month, may be determined by such procedure. The comparison of such normals will show in the case of abnormal changes in any district or section for any season whether and how they are compensated by compensating variations elsewhere. There are interesting studies as to what sequences there may be to follow such atmospheric variations occurring over any region or country—either in that region or country, or elsewhere—and how and where the compensating variations occur, and with what concomitants or sequences of meteoric changes.

"There is the hope to gain in this way or by studies such study will suggest information to affect the commercial and agricultural interests of the world.

"There is the further hope that as it is more fully realised by the different peoples, how close in the future the practice of such investigations draws, each member of the family of nations will find its own interests in labours of this description, and draw more closely the bonds and join with energy in a work which has so begun to connect them. The undertaking, world-wide in extent, is capable of rendering a world-wide benefit."

The chart before our readers bears information condensed from thirty—one for each day of the month—of the world weather charts above described, and exhibits one path of study to be pursued. It shows for one month the lines of mean pressure, mean temperature, and average wind direction on land and sea within the limits of civilisation on the Northern Hemisphere. The appearance of the map marks the commencement of the first actual and

current study of the atmosphere of the whole Northern Hemisphere for practical use.

It will be noticed from the Report that the Chief Signal Officer, General Myer, while pressing forward month after month his plan, commenced on the American Continent nine years ago—in 1870—of mapping by weather charts and simultaneously the Northern Hemisphere, and fixing its success, reaches out a helping hand to every people. The Report asks all nations to stand side by side with the United States in carrying forward the work now marked out, and announces that so far as the United States is concerned the least of the co-operators shall receive the perfected work as fully as the greatest. Every separate observer or ship at sea co-operating in this work receives a copy of the chart he has helped to make. Aside from any national benefit the work is to benefit the human race.

THE BRITISH ASSOCIATION

THE Forty-ninth Annual Meeting of the British Association was opened yesterday at Sheffield, under the presidency of Prof. Almam, F.R.S. The new secretary, Mr. J. E. H. Gordon, has made several innovations in the conduct of the business of the Association, which, when fairly established, will no doubt be decided improvements.

At the end of last week all the arrangements for the meeting were in an unusually forward state. Circulars had been sent to every member of the Association, and all the more prominent members who had replied have been well provided for by private hospitality, unless they desired to be otherwise accommodated. It is expected that the meeting will in all respects be a very good one. At all events, no efforts have been spared by the town of Sheffield to make it so, and the local secretaries and other officers have been at their posts from soon after eight in the morning to late every evening. A handy Guide-Book to Sheffield and its neighbourhood has been compiled for the special use of those attending the meeting of the Association.

There will be an excellent display of all the more recent scientific inventions at the second *soirée* given by the Local Committee on Tuesday the 26th. Independently of the large number of excursions arranged for Saturday the 23rd, and Thursday the 28th, most of the leading manufacturers will be opened to the members, or will be visited by parties invited for special days. The Firth College, the gift to the town of Mr. Mark Firth, will now be used for the first time, and will be found admirably adapted for the reception-room and offices. It is to be formally opened for educational purposes in October by Prince Leopold. At one time much anxiety was felt with reference to this building. The long and severe winter delayed operations so much, that but for subsequent great energy it could not have been finished for the meeting. For the last two weeks it has been used for the temporary offices of the Association, though the secretaries and others have been compelled to carry on their business along with all sorts of workmen. If, as originally fixed, the meeting had commenced on August 6, it would have been almost impossible to have used the college for the reception-room.

The Local Committee have had a good deal of trouble, we believe, in the matter of lodging accommodation; but this has happily been surmounted. The citizens of Sheffield have most liberally responded to the request for hospitality, and special arrangements have been made for the adequate refreshment of members who conscientiously attend to the thirsty and appetising work of the Sections; for it seems Sheffield is rather